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Sex Differences in Social Risk Factors for Suicidal Behaviour

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Abstract

Objective: To explore the sex differences in social risk factors for attempted suicide using a case-control design. *Methods:* Individuals who attempted suicide (n=146) were compared to psychiatric and community controls (n=197). Information about social factors was collected upon recruitment. Logistic regression was used to assess associations between social factors and attempted suicide. *Results:* Differences were found between men and women in social risk factors associated with suicide attempts. Completion of post-secondary education (OR 0.30, 95% CI 0.14-0.64, p=0.002) and religious practice (OR 0.43, 95% CI 0.19-0.92, p=0.031) were significant protective factors in women. Unemployment (OR 4.31, 95% CI 1.44-13.72, p=0.01) and stressful life events (OR 4.71, 95% CI 1.58-16.61, p=0.009) were significantly associated with increased risk of suicide attempts in men. Subgroup analyses revealed that these factors were only significant in comparisons with non-psychiatric controls. *Conclusion:* Our

findings could aid clinicians in assessing suicide risk and identifying vulnerable individuals by tailoring the assessment of risk factors for men and women.

Keywords: Suicidal behaviour; attempted suicide; sex differences; social factors; risk factors; case-control study

Abbreviations: DISCOVER, Determinants of Suicide Conventional and Emergent Risk; CI, confidence interval; HiREB, Hamilton Integrated Research Ethics Board; OR, odds ratio; ref., reference category; SD, standard deviation; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology; MINI, Mini-International Neuropsychiatric Interview.

1. Introduction

Suicide is one of the leading causes of death worldwide. It claims the lives of nearly one million people each year, and has a devastating impact on families, communities, and society (WHO, 2014). Attempted suicide occurs 10-20 times more often than completed suicide, and is a significant risk factor for death by suicide in the general population (Mann, 2003; WHO, 2014).

There are a number of factors that are thought to contribute to suicide risk, including biological and social factors. Known biological risk factors include psychiatric disorders (particularly mood disorders) and chronic illness (Crump, Sundquist, Sundquist, & Winkleby, 2014). Social risk factors may include sociodemographic factors, as well as living alone and adverse experiences (Crump et al., 2014; Dube et al., 2001; Schneider et

al., 2014; Wang et al., 2012). Potentially protective social factors include religious involvement and social connectivity (Kleiman & Liu, 2013; Rushing, Corsentino, Hames, Sachs-Ericsson, & Steffens, 2013).

There is some evidence that social risk factors for suicidal behaviour may differ between the sexes. Studies have shown that sociodemographic factors are stronger predictors of suicide in men than in women, including unmarried status, low education level, low income, and unemployment (Crump et al., 2014; Qin, Agerbo, & Mortensen, 2003). A study of over 6 000 older adults who had died by suicide found that men were more likely than women to have experienced interpersonal problems, job or legal problems, or a recent crisis (Karch, 2011). In a study of individuals who had attempted suicide in Japan, financial and work problems were more common among men, while family problems and loneliness were more common among women (Narishige, Kawashima, Otaka, Saito, & Okubo, 2014). The evidence generally supports the notion that men are more vulnerable to socioeconomic difficulties while women are more vulnerable to psychosocial difficulties (Crombie, 1990; Hankin & Abramson, 2001).

Relatively few studies have explored the topic of sex differences in risk factors for suicidal behaviour. Of those that did, some used unadjusted statistical analyses, which may have led to biased estimates (Karch, 2011; Narishige et al., 2014). A thorough understanding of the sex differences with regard to social risk factors for suicidal behaviour will help clinicians to identify and treat individuals at risk.

The objective of this study is to explore the sex differences in social risk factors for attempted suicide using a case-control study design.

2. Methods

2.1 Data Collection and Study Participants

The data were collected for the Study of Determinants of Suicide Conventional and Emergent Risk (DISCOVER) (Samaan et al., 2015). DISCOVER is an observational matched case-control study that aims to identify the risk factors involved in suicidal behaviour. The case-control study design was chosen because it allowed us examine the risk factors for a rare event (attempted suicide) with better statistical power than is possible in a prospective cohort study.

The study participants were recruited from hospitals and community settings between March 2011 and November 2014 in Hamilton, Ontario, a mid-sized city in Canada. The Hamilton Integrated Research Ethics Board (HiREB) approved this study (REB numbers 10-661 and 11-3479).

The study included men and women aged 18 or older who could provide written informed consent, communicate in English, and follow study procedures. Cases were defined as individuals who had been admitted to hospital following a serious suicide attempt with intent to die (as assessed using the Beck Suicide Intent Scale (Beck, Kovacs, & Weissman, 1979)) and requiring medical or psychiatric intervention. Two control groups were included. The first control group consisted of individuals with serious psychiatric disorders requiring hospitalization but no history of suicide attempts. Since most suicide attempts occur in the context of a psychiatric disorder (Harris & Barraclough, 1997), the inclusion of the psychiatric control group allowed us to capture the at-risk population and make clinically meaningful comparisons. The second control group consisted of individuals recruited from community and non-psychiatric clinical

areas with no history of suicide attempts. While most of the cases and control participants in DISCOVER were matched on age and sex, additional, unmatched participants were also recruited in order to increase the size of the sample. Since we included these individuals in our analyses, we did not perform matched statistical analyses and adjusted for age and sex.

Trained research personnel approached eligible inpatients and provided detailed information about the study. Community controls were recruited by distributing advertisements in hospitals and community settings. Upon recruitment, participants signed informed consent forms and underwent a structured interview. Data were collected on sociodemographic variables, medical history, health-related behaviours, psychopathology, and suicidal behaviour. All of the study questionnaires were compiled using previously validated diagnostic and assessment tools. These included the Mini-International Neuropsychiatric Interview (MINI) (Sheehan et al., 1998), the Beck Suicide Intent Scale (Beck et al., 1979), and the Social Support Questionnaire (Sarason, Levine, Basham, & Sarason, 1983). For participants in the case group, a detailed description of the suicide attempt was recorded. All assessments were administered in hospital or community by trained research staff.

2.2 Statistical Analysis

Logistic regression models were used to assess the associations between social risk factors and attempted suicide in men and women separately, and in the entire sample. Factors for which significant univariate differences were found (chi-square test, P-values below 0.05) were included in the logistic regression models. These factors are age,

education, employment status, marital status, religious practice, major stressful life events, and childhood abuse. Psychiatric and community controls were combined into one group for the primary analyses. Subgroup analyses were performed in which cases (within each sex group) were compared to psychiatric and community controls separately. R version 3.0.2 was used for all analyses (Team, 2014).

2.3 Power Analysis

The generally accepted rule of thumb for logistic regression requires a minimum of 10 events per predictor variable (Peduzzi, Concato, Feinstein, & Holford, 1995). Our sample includes 146 events (individuals who attempted suicide) (81 women and 65 men). We included 7 predictor variables in our logistic regression analysis. Therefore, we believe our analyses have adequate power to detect significant differences.

The reporting of this study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Vandenbroucke et al., 2007).

3. Results

The study recruited a total of 343 participants, including 146 cases, 104 psychiatric controls, and 93 community controls. The recruitment process is summarized in Figure 1. The characteristics of the sample are summarized in Table 1. The mean age of the participants was 45.45 years (SD=15.43). Approximately half of the participants were female (52.19%). No significant differences between cases and controls were found

in age or sex. The psychiatric diagnoses, according to the MINI, are summarized in Table 2.

3.1 Primary Analysis

The results of the logistic regression, including odds ratios (OR), 95% confidence intervals (CI) and p-values, are presented in Table 3.

In women, being on disability (OR 6.12, 95% CI 2.36-16.96, p<0.001), and being widowed, separated, or divorced (OR 3.11, 95% CI 1.06-9.59, p=0.042) were significantly associated with increased risk of attempted suicide. Post-secondary education (OR 0.30, 95% CI 0.14-0.64, p=0.002) and religious practice (OR 0.43, 95% CI 0.19-0.92, p=0.031) were associated with decreased risk of attempted suicide.

In men, factors that were significantly associated with increased risk of attempted suicide included being unemployed (OR 4.31, 95% CI 1.44-13.72, p=0.01) or on disability (OR 3.04, 95% CI 1.04-9.20, 0.04); being widowed, separated, or divorced (OR 3.49, 95% CI 1.06-12.32, p=0.044); and experiencing a major stressful event in the past year (OR 4.71, 95% CI 1.58-16.61, p=0.009).

All assumptions of logistic regression were satisfied (dichotomous outcome, independent observations, linearity of independent variables, no outliers, correct model specification, independent errors). The variance inflation factors (VIF) for all variables were close to 1, indicating that multicollinearity was not a concern.

3.2 Subgroup Analyses

In both men and women, comparing individuals who had attempted suicide to psychiatric and community controls separately revealed that most of the differences were only between the cases and community controls. In women, of the factors found to be significantly associated with attempted suicide risk in the primary analysis, only post-secondary education (OR 0.38, 95% CI 0.15-0.90, p=0.03) was a significant protective factor when community controls were excluded from the model. When cases were compared to only community controls, all factors that reached significance in the primary analysis remained significant.

In men, none of the factors found to be significantly associated with attempted suicide in the primary analyses were significant when cases were compared to just psychiatric controls. When cases were compared to community controls, unemployment and major stressful events remained significant risk factors.

4. Discussion

In this study we used multivariable logistic regression models to investigate the associations between a variety of social factors and suicidal behaviour in men and women.

Our primary analyses revealed that some of the social risk factors for attempted suicide differ between men and women. Completion of post-secondary education and religious practice were found to be significant protective factors in women but not in men. Unemployment and experiencing a major stressful life event in the past year were significant risk factors in men but not in women.

Our finding that religious practice was protective only in women is consistent with evidence of a stronger protective effect of religiousness on mental and physical well-being in women than in men (McCullough, Hoyt, Larson, Koenig, & Thoresen, 2000; Spoerri, Zwahlen, Bopp, Gutzwiller, & Egger, 2010). Our finding that unemployment was a significant risk factor only in men is consistent with previous literature showing that men respond more adversely than women to poor economic conditions (Crombie, 1990; Crump et al., 2014; Qin et al., 2003). As well, our finding of a significant association between stressful life events and suicidal behaviour only in men is supported by evidence of a stronger relationship between stressful life events and suicide in men (Lee & Pridmore, 2014). Furthermore, it is possible that in women, the effects of stressful life events are more often mitigated by seeking professional help (Luoma, Martin, & Pearson, 2002) or drawing on support systems (Butler, Giordano, & Neren, 1985).

Our subgroup analyses showed that the major differences found in the primary analyses were in fact between individuals who had attempted suicide and community controls. When community controls were excluded from the models, few significant risk factors remained. This underscores the importance of including psychiatric control groups in studies of suicidal behaviour. Many of the known risk factors for suicidal behaviour have been identified in studies that compared individuals who had engaged in suicidal behaviour to members of the general population (Crump et al., 2014; Narishige et al., 2014; Rushing et al., 2013; Schneider et al., 2014). Since having a psychiatric disorder is a very important risk factor for suicidal behaviour, studies that do not include a psychiatric control group may produce misleading findings. It is likely that the suicide risk factors reported in the literature are in fact related to having a psychiatric illness in

general and are not specific to suicide. As we can see in our study, when cases are compared to psychiatric controls, such risk factors were no longer significant predictors of suicidal behaviour.

Our study has a number of strengths, including its relatively large sample size and inclusion of both psychiatric and community controls. We recruited individuals who had made suicide attempts with specific intent to die, and did not include individuals who had engaged in non-suicidal self-harm. We performed adjusted analyses and explored a variety of social risk factors for suicidal behaviour.

Our study is limited by its cross-sectional design, which precludes us from drawing inferences about causal relationships. Another limitation is that due to the inclusion of past cases of attempted suicide in addition to recent cases, some of the variables measured may have changed since the time of the attempt. For example, our study questionnaire asked participants to list stressful life events that had occurred within the past year. For individuals whose suicide attempts occurred earlier than a year prior to recruitment, their responses would not have reflected the period of time surrounding their attempts. Similarly, questions about employment status or marital status may have elicited responses that differed from what they would have been closer to the time of the past attempt.

Relatively few studies have examined the sex differences in risk factors for attempted suicide. Despite its limitations, our study's strengths distinguish from other studies on this topic, which may have been biased due to inadequate statistical power, confounded statistical analyses, and the absence of psychiatric control groups. Our study

makes an important contribution to our understanding of sex differences in social risk factors for suicidal behaviour.

5. Conclusions

Our case-control study reveals that some social risk factors for attempted suicide differ by sex, though only when compared to community controls. While sex may be considered in clinical assessments of suicide risk (as men are more likely to die by suicide while women are more likely to attempt suicide (Mann, 2003)), clinicians should keep in mind the differing effects of other risk factors between the sexes. An appreciation of these differences could help clinicians identify individuals who are most vulnerable toward suicidal behaviour. Additional well-powered studies of social risk factors for suicidal behaviour and the sex differences within them will improve both our understanding of this complex phenomenon and our efforts to prevent it.

Declarations

Ethics Approval and Consent to Participate

This study was approved by the Hamilton Integrated Research Ethics Board (HiREB) (REB numbers 10-661 and 11-3479). All participants provided written informed consent.

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Competing Interests

The authors declare no competing interests.

Authors' Contributions

RE developed the research question, analyzed and interpreted the data, and wrote and critically revised the manuscript. SP contributed to data analysis and interpretation, and critically revised the manuscript. MB and BD assisted with recruitment and critically revised the manuscript. WE was the research assistant for this study and was responsible for recruitment, interviews, and data collection. JD was the study coordinator responsible for the daily running of the study, training research assistants and study personnel on study-related procedures. SR was the study project manager responsible for the study conduct; with ZS she designed the study protocol, provided supervision of study personnel, and coordinated the overall study management. HS and EI are nurses specializing in psychiatry; they recruited hospitalized study patients, conducted interviews, collected blood samples, and provided feedback on participant recruitment and study procedures. PM was responsible for database management, quality and edits, checks of data, and provision of reports, including age and sex matching status, to the study team for the weekly study meetings. SI was responsible for data management and preparation of data reports to the team. MD designed the dietary tool and analyzed the dietary data for the DISCOVER study. JB provided advice on study procedures including recruitment and the inclusion of psychiatric controls based on her expertise in emergency psychiatry and suicide prevention. RA and LM critically revised the manuscript. LT was

responsible for the case-control study design, and overall methodological and statistical aspects of the study. ZS conceived the study and was principally responsible for the conduct of the study and obtaining funding. ZS also developed the research question, contributed to data analysis and interpretation, and critically revised the manuscript. All authors have reviewed and approved the final manuscript.

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Table 1: Baseline Sample Characteristics

	Cases (n=146)	Psychiatric controls (n=104)	Community controls (n=93)	All controls (n=197)
Age (years): Mean (SD)	45.18 (14.70)	45.01 (14.23)	46.36 (17.81)	45.65 (15.99)
Sex (% female)	81 (55.48)	52 (50.00)	46 (49.46)	98 (49.75)
Ethnicity (% Caucasian)	135 (92.47)	81 (79.41)	61 (65.59)	143 (72.82)
Completed post-secondary education (%)	58 (40.28)	51 (50.49)	69 (74.19)	120 (61.86)
Employment status				
Employed (%)	37 (25.34)	36 (34.62)	57 (61.29)	93 (47.21)
Unemployed (%)	29 (19.86)	21 (20.19)	10 (10.75)	31 (15.74)
Retired (%)	17 (11.64)	7 (6.73)	20 (21.5)	27 (13.71)
On disability (%)	56 (38.36)	28 (26.92)	3 (3.23)	31 (15.74)
On social security (%)	7 (4.79)	9 (8.65)	0 (0)	9 (4.57)
Marital status				
Never married (%)	45 (31.03)	43 (41.75)	28 (30.11)	71 (36.22)
Married/common law (%)	39 (26.90	31 (30.10)	50 (53.76)	81 (41.33)
Widowed/separated/divorced (%)	61 (42.07)	29 (28.16)	15 (16.13)	44 (22.45)
Living alone (%)	64 (46.04)	47 (46.08)	27 (29.03)	74 (37.56)
Practice religion (%)	67 (50.38)	57 (58.16)	62 (66.67)	119 (62.39)
Social Support (% satisfied)	115 (92.74)	80 (85.11)	90 (98.90)	170 (91.89)
Experienced major life stress(es) in past year	117 (89.31)	84 (89.36)	46 (49.46)	130 (69.52)
Experienced childhood	79	47 (50.54)	21 (22.58)	68 (36.56)

abuse (%)	(59.85)			
Bullied as a child (%)	66 (50.77)	45 (48.39)	29 (31.18)	74 (39.78)

Table 2: Psychiatric Diagnoses[1]

	Cases (n=66)	Psychiatric Controls (n=92)	Community Controls (n=92)	Univariate Differences[2]
Mood disorder (%)	63 (95.45)	76 (82.60)	26 (28.26)	χ^2=95.22, P<0.001
Anxiety disorder (%)	43 (65.15)	49 (53.26)	9 (9.78)	χ^2=58.93, P<0.001
Alcohol/substance abuse (%)	27 (15.15)	20 (21.74)	5 (5.43)	χ^2=29.44, P<0.001
Psychotic disorder (%)	3 (4.55)	6 (6.52)	0 (0)	P=0.024

[1] Since not all participants underwent the Mini-International Neuropsychiatric Interview (MINI), the group sizes for this table are smaller.
[2] Chi-square tests were used to compare proportions. Fisher's exact test was used for categorical variables when one or more values in the contingency table were below 5.

Table 3: Association between Social Factors and Attempted Suicide

	Women (n=162)			Men (n=147)			Entire sample (n=309)		
Variables	**OR**	**95% CI**	**P-value**	**OR**	**95 % CI**	**P-value**	**OR**	**95 % CI**	**P-value**
Age (years)	0.99	0.95 - 1.01	0.192	1.01	0.97 - 1.05	0.760	0.99	0.96- 1.01	0.327
Completed post-secondary education	0.30	0.14 - 0.64	0.002**	0.66	0.29 - 1.50	0.323	0.48	0.28- 0.82	0.007**
Employment status									
Employed (%) (ref.)	1.00	--	--	1.00	--	--	1.00	--	--
Unemployed (%)	0.84	0.26 - 2.61	0.771	4.31	1.44 - 13.72	0.011*	2.00	0.95- 4.25	0.070
Retired (%)	1.23	0.29 - 5.04	0.778	2.43	0.61 - 10.11	0.211	1.78	0.68- 4.62	0.236
On disability (%)	6.12	2.36 - 16.96	<0.001***	3.04	1.04 - 9.20	0.044*	4.33	2.19- 8.76	<0.001***
On social security (%)	0.30	0.014- 2.44	0.321	1.62	0.22 - 11.81	0.621	0.66	0.16- 2.41	0.544
Marital status									
Never married (ref.)	1.00	--	--	1.00	--	--	1.00	--	--
Married	2.89	0.97 - 9.05	0.061	0.81	0.25 - 2.61	0.726	1.56	0.73- 3.38	0.256
Widowed/separated/divorced	3.11	1.06 - 9.59	0.042*	3.49	1.06 - 12.32	0.044*	3.11	1.45- 6.86	0.004**

Practice religion	0.43	0.19 - 0.92	0.031*	0.75	0.32 - 1.76	0.507	0.60	0.35- 1.03	0.066
Major stresses	2.20	0.80 - 6.40	0.134	4.71	1.58 - 16.61	0.009 **	3.08	1.53- 6.50	0.002**
Childhood abuse	1.15	0.51 - 2.56	0.725	1.79	0.79 - 4.07	0.162	1.44	0.84- 2.49	0.184

Abbreviations: OR, odds ratio; CI, confidence interval; ref., reference category
* Significant at the 0.05 level, ** significant at the 0.01 level, *** significant at the 0.001 level

Figure 1. Flow diagram for participants included in study